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The usefulness of fine needle aspiration cytology in the diagnosis of parotid gland tumors

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Abstract
Background: Various parotid gland diseases are seen clinically including inflammation, sialolithiasis, benign and malignant tumors. It is important to differentiate between these to make a correct diagnosis, the aim of this study is to assess the usefulness of fine needle aspiration cytology as a preoperative diagnostic tool in the diagnosis of parotid gland tumors.
Method: A retrospective study was done on 110 Iraqi patients with apparent parotid gland swelling, all patients were subjected to FNAC by using 22-gauge needle attached to a 10ml syringe with at least two needle passes were made for each patient.
Results: The number of cases in each category were: nondiagnostic 5.5% and in 94.5% were diagnostic. Neoplastic lesions were observed in 71.20% of patients, non-neoplastic lesions in 28.80% of patient.
Conclusion: Fine needle aspiration cytology is a reliable examination providing important information to the surgeon in the preoperative diagnostic assessment when Milan system was applied.

Keywords: the usefulness, fine needle aspiration cytology, diagnosis, parotid gland tumors

Introduction

Major salivary gland tumors account for 3% of head and neck cancers [1]. Malignant salivary gland neoplasm account more than 0.5% of all malignancies and approximately 3-5% of all head and neck cancer [2]. Benign tumors are more common than malignant tumors, the majority (85%) originated from parotid gland. the most common benign tumor is pleomorphic adenoma while mucoepidermoid carcinoma is the most common malignant tumor, Other causes of parotid gland masses include metastatic cancer, inflammatory conditions and lymphoma [3, 4]. Fine needle aspiration cytology (FNAC) is widely accepted modality of diagnosis in the preoperative assessment of the head and neck tumors [5]. Although FNAC was first described in 1930s, salivary gland FNAC is a relatively new discipline, having gained wide acceptance only in the past 40 years [6]. The procedure is a cytodiagnostic method where by a needle is used to acquire a sample of cells and microparticles of tissue for morphological analysis [1]. Meta- analysis of published series indicate 96% sensitivity and 98% specificity for neoplasia whereas distinction between benign and malignant neoplasm has 79% sensitivity and 96% specificity. Because accuracy varies greatly among published studies, the utility of salivary gland FNA is highly practitioner-dependent [6]. However, the value of FNAC for the diagnosis of parotid gland masses, has been questioned due to its low sensitivity regarding malignancy, variation in reported results, and the belief that most parotid masses require surgery in any case [7, 8]. The precise classification of salivary gland neoplasm by FNAC is possible for many of the commonly encountered lesions but remain problematic for a number of less common entities [6].

FNAC is minimally invasive procedure that does not require anaesthesis [5]. It is well tolerated, simple, safe and cost-effect [7, 9]. Moreover, it can be easily repeated in the event of non-diagnostic results, thus improving diagnostic precision [10]. It is preferred biopsy method that poses minimal risk to the patient and provide excellent distinction between benign and malignant parotid tumors [1] The Milan System for Reporting Salivary Gland Cytopathology (MSRSGC) has been recently developed to standardize the terminology for reporting FNAC of salivary gland and to improve the communication between clinicians and pathologists. The MSRSGC is a seven-tiered classification system comprising: I, nondiagnostic;

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II, nonneoplastic; III, atypia of undetermined significance (AUS); IVA, benign neoplasm; IVB, salivary gland neoplasm of uncertain malignant potential (SUMP); V, suspicious for malignancy (SM); and VI, malignant. It also provides estimated risk of malignancy (ROM) and clinical management recommendations for each category [11].

Patients and Methods
A retrospective study included a total of 110 patients who visited the Main Laboratory Division in Al- Yarmook Teaching Hospital in Baghdad during the period (January 2011-February 2019) complaining of apparent parotid gland swelling. The age of the patients ranged between (1-77 years). All patients were subjected to FNAC by using 22-gauge needle attached to a 10ml syringe with at least two needle passes were made for each patient. The aspirated material was expelled onto two slides then thin smears were done and fixed in alcohol immediately. Papanicolaou stain was used for slides staining. We classified our FNAC results into seven categories according the Milan System for Reporting Salivary Gland Cytopathology (MSRSGC) [11].

Statistical analysis was performed by using SPSS version 23 and different variables were analyzed.

Result
FNAC samples were obtained in 110 cases. The mean ± SD age was 44±18.5 years, ranging between 1-77 years, 59(53.6%) were female and 51(46.4%) were male, table -1-.

Table 1: Demographic character of studied patients

Variables		Number	Percentage
Age	<18 years	13	11.8%
	18-40 years	29	26.4%
	>40 years	68	61.8%
Gender	Female	59	53.6%
	male	51	46.4%

FNAC results were "non-diagnostic" in 6 patients (5.5%) and in 104 patients (94.5%) were diagnostic. Neoplastic lesions where observed in 74 (71.2%) patients and non-neoplastic lesions in 30(28.8%) patients, figure -1-.
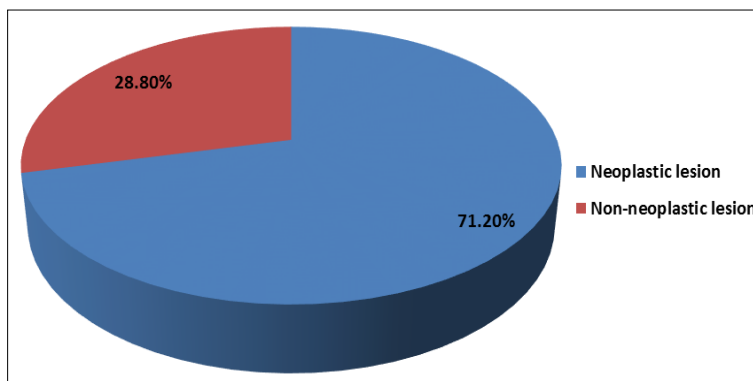

Fig 1: FNAC result of studied patients

The cytopathological features in a non-neoplastic lesion was shown in table -2-.

Table 2: Cytopathological diagnosis of non-neoplastic lesions among studied patients

Cytopathological diagnosis of non-neoplastic lesions	Number	Percentage
Lymphoepithelial sialadenitis	18	17.3%
Abscess	9	8.7%
Reactive lymphadenitis	1	0.96%
Chronic granulomatous inflammatory process	1	0.96%
Cyst	1	0.96%

Table 3: The cytopathological features in a neoplastic lesion shown in table-3

Cytopathological diagnosis of neoplastic lesions	Number	Percentage
benign epithelial cells	44	42.3%
pleomorphic adenoma	21	20.1%
Aus	6	5.7%
Suspicious	2	1.9%
Warthin	1	0.96%

Discussion
FNAC of salivary gland is used worldwide for the diagnosis and management of salivary gland tumors. It provides a minimally invasive, safe, cost-effective, and accurate technique that is extremely useful in identifying a substantial subset of salivary gland nodules as benign and thus reduces unnecessary invasive surgical procedure in patients with benign diseases. In addition, it guides the further management strategy [12, 13]. The Milan System for Reporting Salivary Gland Cytopathology (MSRSGC) was introduced in 2018 [11]. The goal of the MSRSGC was to develop a practical, evidence-based, user-friendly, and internationally accepted classification system. The system includes characterization and management algorithms for each category. Salivary gland tumors are one of the most heterogeneous groups of neoplasms with cytopathological features overlapping among the entities, Due to those facts, salivary gland cytopathology is one of the most challenging areas of cytology [14]. In this study, FNAC samples were obtained in 110 cases ranging between (1-77) years, males formed 51(46.4%,) while the females formed59 (53.6%), this finding is in agreement with Esther *et al.* study [15].

Neoplastic Lesions: the study revealed that benign tumors were 46.9% from all neoplastic, this finding is in agreement with N. Fakhry *et al.*, and Deepti Arora *et al.* [3, 16]. the pleomorphic adenoma in current study represented 21.1% of neoplastic tumors, this finding is in agreement with Zerpa Zerpa V *et al.*, study [1] and also concordance with study of Lyu HX *et al.*, study [17] who reported the incidence of pleomorphic adenoma as 67.7%, Although most of these neoplasms were readily identified because of their biphasic pattern, comprising epithelial/myoepithelial cells and

magenta chondromyxoid predominantly epithelial types to predominantly stromal types which often poses diagnostic challenge to cytopathologists. If epithelial component predominates in smears, then the tumor needs to be differentiated from monomorphic adenoma, myoepithelioma and low-grade carcinoma. However, in cases of increased stroma with or without hyaline globules, it has to be differentiated from adenoid cystic carcinoma [18, 19]. If myxoid material is abundant and epithelial cells are sparse, then it can be mistaken for retention cyst cases, the myoepithelial cells have tremendous potential for differentiating into various cytomorphologic forms, a finding which is more evident on cytologic smears and are seen as plasmacytoid, spindle and stellate cells. The smears with predominance of plasmacytoid myoepithelial cells need to be differentiated from malignant lymphoma and plasma cell proliferation [20]. Warthin's tumor represent 0.96% of neoplasm, affecting only males and involving parotid gland. The similar results were obtained by Li et al., study [21] and de Oliveira et al., study [22]. The three main components that characterize the cytological smears of Warthin's tumor are oncocytes, lymphocytes and dirty fluid background, the differential diagnosis of Warthin's tumor includes lymphoepithelial cysts of salivary gland, chronic inflammatory and obstructive duct lesions exhibiting oncocytic metaplasia and lymphocytes [23, 24] and 1.9% case suspicious of malignancy, this in agreement with Rossi ED et al., study [25]. In the suspicious for malignancy (SM) and malignant diagnostic categories, definitions and criteria are analogous to the same categories in other anatomic sites. Lesions classified as SM have features suggestive of malignancy but the sample is either deficient in the quality of the cellular features or the quantity of abnormal cells present. For salivary gland FNAC diagnosed as malignant, criteria are provided to enable cytologists to sub classify the tumors into low-grade and high-grade entities, since these designations have significant implications for patient management. Management of high-grade carcinomas may include radical surgical resection, sacrifice of major nerves, and neck dissection. The six-tier Milan system for reporting salivary gland cytopathology has been recently introduced with the support of the American Society of Cytopathology and the International Academy of Cytology with hopes of standardizing the reporting of salivary gland FNA [26]. The diagnostic category of AUS in the MSRSGC is defined as a salivary gland FNAC that lacks either qualitative or quantitative cytomorphologic features to be diagnosed with confidence as either nonneoplastic or neoplastic. It encompasses a heterogeneous group of lesions ranging from nonneoplastic to malignant. The histologic follow up of AUS cases showed nonneoplastic, malignant, benign neoplasm, and atypical [27]. In this study AUS 6(5.7%)by FNA only which may show ROM consider with Wang et al., study [28] who reported a high ROM (61%) for "atypical" salivary gland FNA based on a multi-institutional study with 154 cases having histologic follow-up. Lymphoma also accounted for the most common malignant diagnosis or lower similar to the reports by others [29, 30].

Non-neoplastic lesions
In the current work, non-neoplastic lesions constituted18.8% of adequate parotid salivary gland aspirates, this in agreement with Bhutani N et al., study [31]. Lymphoepithelial sialadenitis was seen in 18(17.3%) followed by1(o.96%) obtained in lymphoepithelial cyst, Non-neoplastic

Lymphocytic Cysts Salivary gland lesions that fall into this category are lymphoepithelial cysts. The term lymphoepithelial cyst (LEC) was introduced Ihrler S et al. [32] HIV-associated LEC usually manifest as multiple, bilateral lesions affecting the parotid glands. They may sometimes be the first manifestation of HIV infection. LEC can also occur in association with chronic infection and autoimmune sialadenitis, most commonly Sjögren syndrome [33]. In Sjögren syndrome, minor salivary glands tend to be involved. LEC are acquired cysts, postulated to either arise from cystic transformation of inclusions within intra-/peri-salivary gland lymph nodes or secondary to obstruction from lymphoid hyperplasia within the salivary gland [34]. Abscess 9 (8.7%) and this is agree with Yogambal et al., study [35]. Reactive lymph node in our study included1(0.96%) and this result disagrees with Howard et al., study [27] who reported that reactive lymph node was the most common nonneoplastic diagnosis, Chronic granulomatous inflammatory Granulomatous infections of the salivary gland Affect the adjacent lymphatic system and the parotid gland. In fulminant cases, it affects the glandular parenchyma. Signs of the ailment can be moderate or gradual swelling of the ganglia may be present. It can be mistaken for a neoplastic tumor. The diseases that can lead to granulomatous infections are represented by TB, syphilis, actinomycosis, cat-scratch disease, toxoplasmosis and tularemia FNA may be negative in most of the cases. Granulomatous infection of the salivary glands can affect children but also old people and often lead to a gradual increase in the size of the salivary gland and lymph nodes and it can be mistaken for a neoplastic tumor [22]. Differential diagnosis is based on a carefully done anamnesis, on the physical examination and identifying the etiologic agent that can cause the disease [36].

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